Hydrogen Ion Cyclotron Wall Conditioning for Fuel Removal on TEXTOR and ASDEX Upgrade

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The Ion Cyclotron Wall Conditioning (ICWC) technique, applicable in presence of the toroidal magnetic field, is envisaged in ITER to recover from disruptions and other events, for recycling control and for fuel removal [1]. Various experiments on different devices as well as modelling efforts are advancing to consolidate this technique. This contribution focuses on a selection of recent hydrogen ICWC experiments on TEXTOR and ASDEX Upgrade. It has been shown previously that pulsed ICWC operation has the advantage of increasing the removal efficiency of wall desorbed molecules while limiting the retention of discharge gas [2]. Recent experiments on tungsten device ASDEX Upgrade showed that the pulsed mode of operation at $p_{H2} = 2.5\times10^{-4}$ mbar, $P_{RF} = 300$ kW (monopole phasing, 30MHz), and $B_T = 2.3$T can remove 12 monolayers of deuterium in less than 1 minute of cumulated RF discharge time. The optimal pulse length is clearly illustrated by the hydrogenic partial pressure time traces as a function of the RF discharge length. Exposure of pre-characterized silicon and a-C:D layers to multi pulse H2-ICWC discharges on TEXTOR allowed to quantify erosion and redeposition at surfaces both parallel and perpendicular to the field lines. Erosion yields at plasma shadowed areas are found to be limited. The presented results in this contribution are tentatively extrapolated to ITER, employing different scaling methods, including the recently upgraded 0D ICWC plasma model [3].

[1] M. Shimada, R.A. Pitts, 2011 Journal of Nuclear Materials 415 S1013-S1016

[2] T. Wauters et al 2011 J. Nucl. Mater. 57 S1033–S1036

[3] T. Wauters et al 2011 Plasma Phys. Control. Fusion **53** 125003